OLYMPIC
SMART SCALE™

Model 35
Operating and Service Instructions

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OLYMPIC MEDICAL
4400 Seventh South • Seattle, WA 98108
Phone 206-624-0426

Weight Monitoring
Radiant Warmer or Incubator

To cancel weight of bedding

- Make bed, then press "Zero" button before placing baby on scale.
- Wait until "0" appears on display before touching scale or placing baby on scale.

To weigh baby

- Press "Display" button to turn display on.
- Press "Gms/Lbs" button to select units.
- Press "Lock" button to lock average weight, computed during last 4 seconds, on display.

Between weighings

- Display can be turned off (or power disconnected) without losing any previous data.
- To retain last weight, leave display locked ("Read" light on).

Any Questions? Please
call Toll-Free 1-800-426-0353.
In Canada, call collect (206) 624-0426

1. Do not use scale in presence of flammable anesthetics.
2. Connect line cord only to properly grounded wall outlet.
3. Always remove incubator or radiant warmer mattress before setting weighing platform in place
4. The scale is designed for use only with the baby confined in an incubator or radiant warmer. Do not use weighing platform on an open table top or for carrying the baby.
5. Never permit liquid to enter the interior of the Display/Control unit case or weighing platform.
6. All service should be performed only by a qualified technician.
7. Always disconnect from the electrical outlet before opening the readout case.

Assembling Weighing Platform

For Radiant Warmer Use—

USE OF ADAPTER BASE

Always use adapter base with Air-Shields Radiant Warmer, Model I.I.C.S., or any radiant warmer with opening in warmer bed.

- Remove warmer mattress.
- Place adapter base centered over opening in warmer bed. (Fig. 3-1)
- Set scale weighing platform on adapter base.
- Store adapter base under scale mattress.

CAUTION Do not use scale on Air-Shields Model I.I.C.S. or any other warmer with opening in bed base without using this adapter.

CAUTION When using scale with opening in bed base, adapter base must be used.

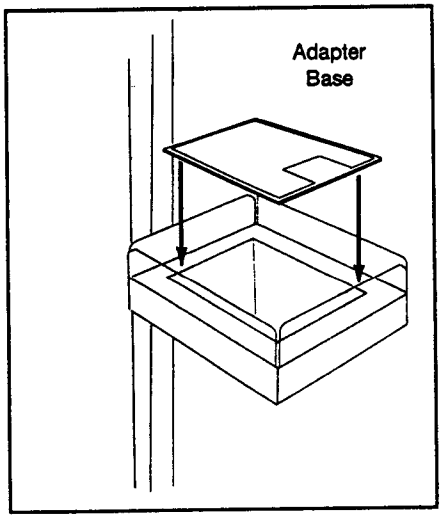


Fig. 3-1

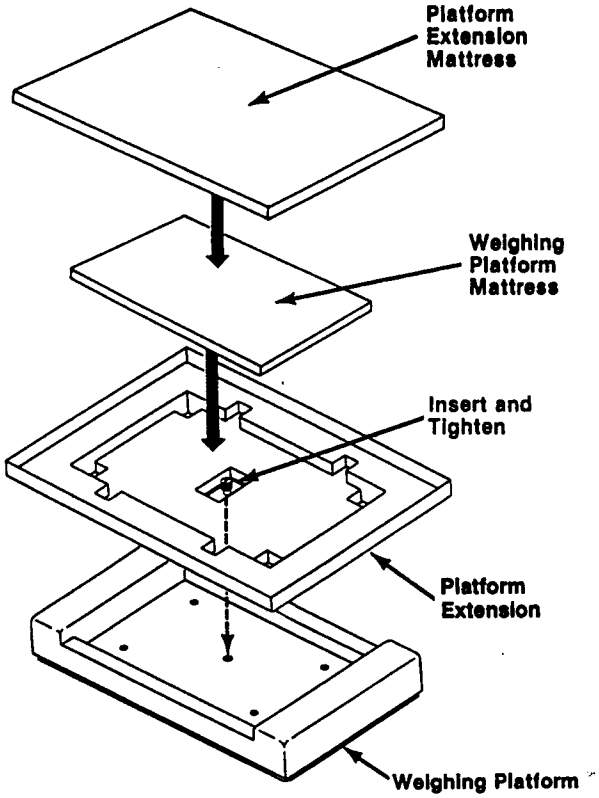


Fig. 3-2

- For radiant warmer use, assemble weighing platform as shown above, using two mattresses.
- **CAUTION** Make sure bolt holding two platforms together is securely tightened.
- Remove regular mattress from radiant warmer and place assembled weighing platform in tray that held mattress.
- **CAUTION** Before placing platform in warmer, make sure that the adapter base is in place over the x-ray window. If you have any questions regarding proper installation, please call toll-free 1-800-426-0353 before attempting to use scale.

USING EXTENDER TRAYS ON RADIANT WARMER PLATFORM

All radiant warmer platforms now include adjustable extender trays. Simply pull out trays (Fig. 3-3) once platform is set onto radiant warmer.

CAUTION

- Extender trays should come close to edge of warmer, but not touch sides. If they touch, weighing errors will occur.
- Do not set baby on extender trays

To Clean

- Remove extender trays by sliding them all the way in the long slot, then along short slot as shown in Fig. 3-4. Lift off.
- Clean with liquid disinfectant or mild soap and water detergent.
- Re-install trays by setting rounded end of slot over guides (Fig. 3-4) on platform and slide along long slot to desired width.

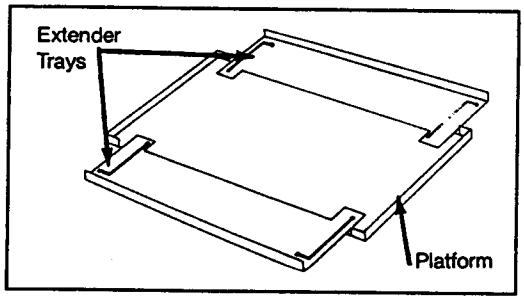


Fig. 3-3

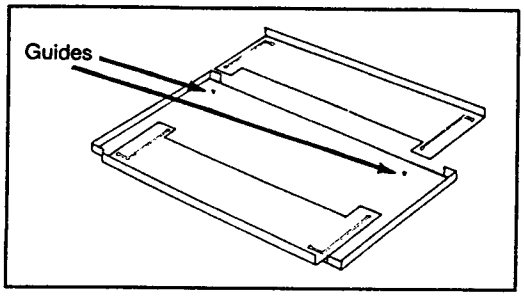


Fig. 3-4

For Incubator Use—

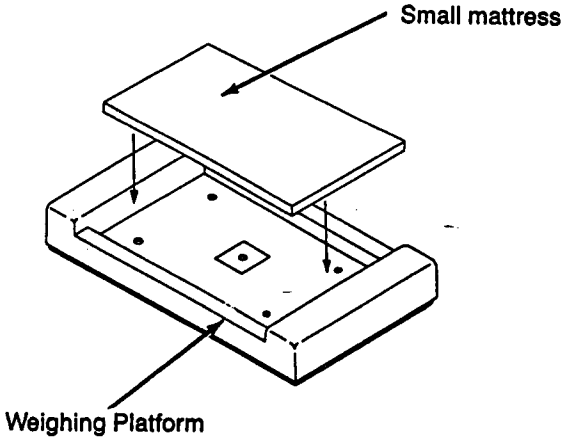


Fig.3-5

- For incubator use, assemble platform as shown above.
- Remove regular mattress from incubator and place weighing platform in tray that held mattress.
- **CAUTION** If weighing platform is too large for incubator tray, please call toll-free 1-800-426-0353 before attempting to use scale.

Installing Display/Control Unit

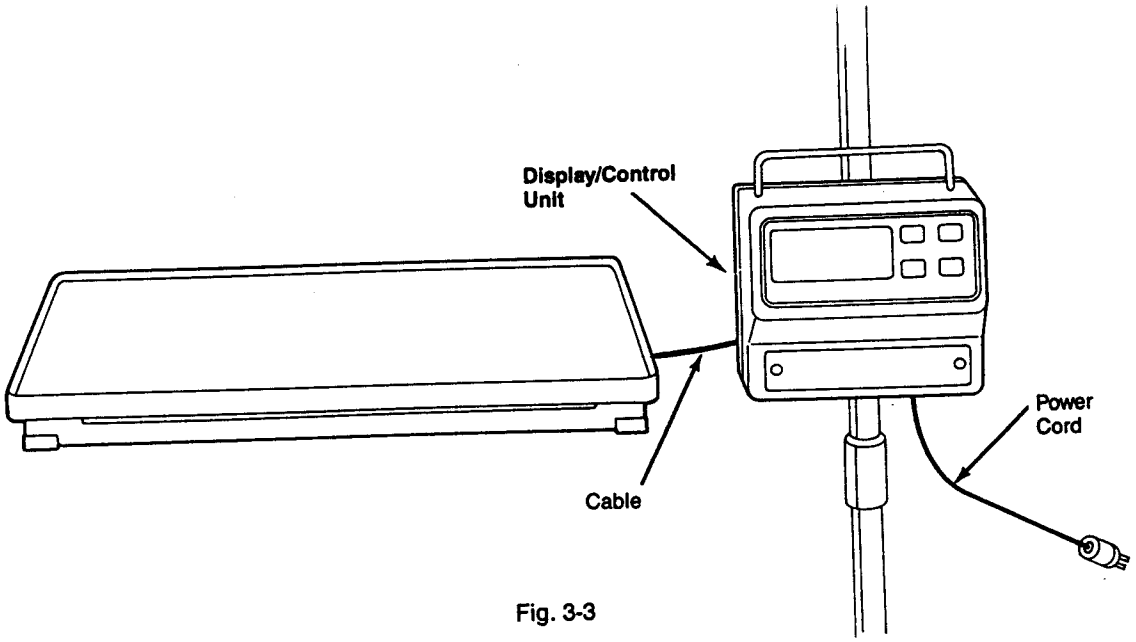


Fig. 3-3

- **CAUTION** Explosion hazard. Do not use scale in presence of flammable anesthetics. (**Note:** Oxygen is **not** a flammable gas.)
- Display/Control can be clamped to pole. **CAUTION** Make sure clamp is securely tightened and that pole is stable.
- Or Display/Control may be placed on instrument shelf.
- Connect cable from weighing platform to socket on back of Display/Control Unit. (When used in incubator pass cable through access hole.)
- Connect power cord to properly grounded, hospital-grade electrical outlet 115 Vac, 60 Hz.
- If the Display/Control Unit is not connected to the weighing platform, the word "Cable" will appear on the display as a reminder to connect them.

CAUTION The Display/Control Unit must be used with the same weighing platform with which it was **last** calibrated, either at the factory or at the hospital. Check label on back of Display/Control Unit for serial number of compatible platform.

Controls and Signals

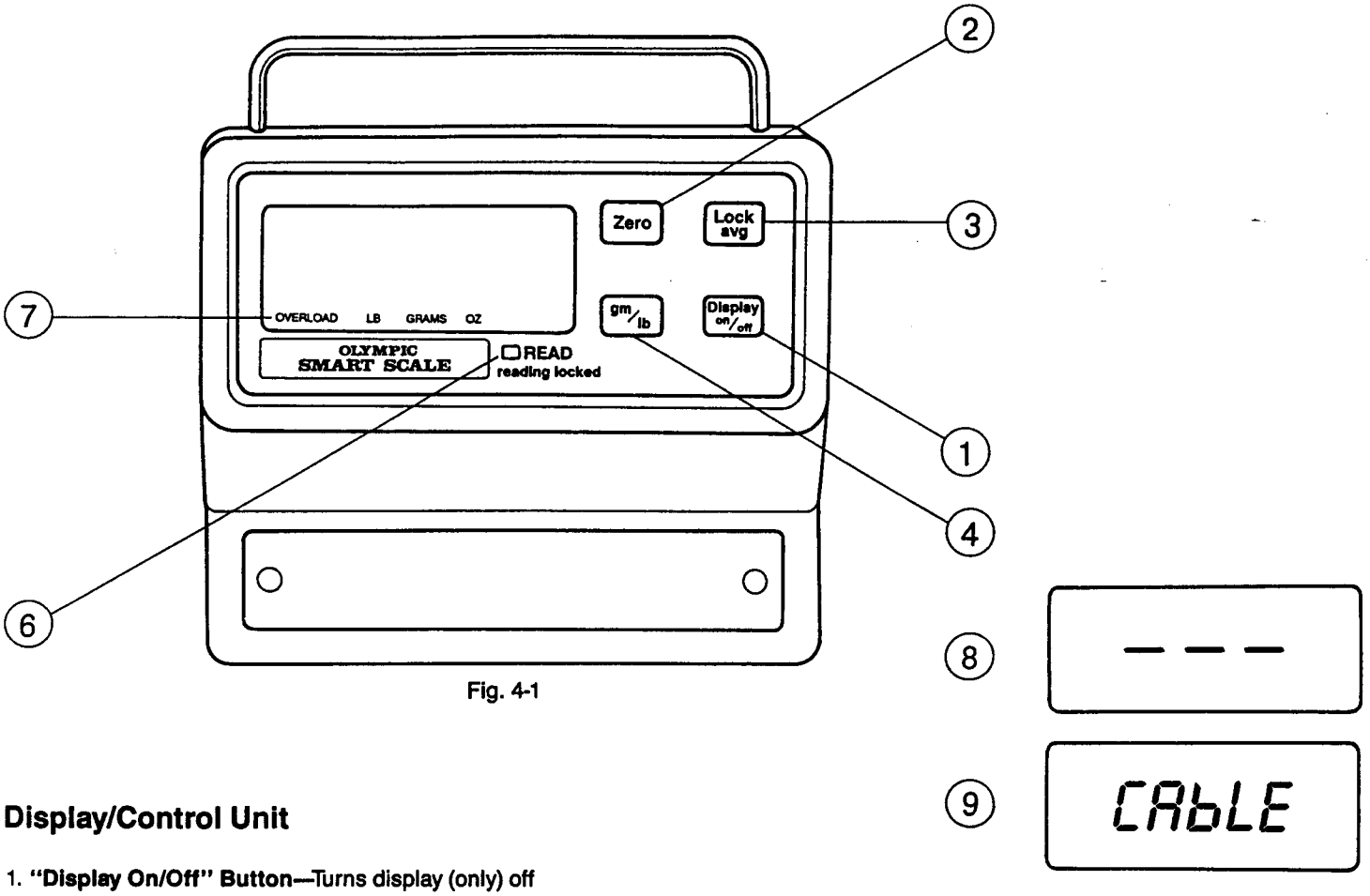


Fig. 4-1

Display/Control Unit

1. **"Display On/Off" Button**—Turns display (only) off between weighings, if desired. **Note:** When display is turned off, scale remembers all previous data, including cancelled weight of bedding.

2. **"Zero" Button**—Has two functions:

   1. Cancels out all weight on platform (mattress, bedding, etc.) and causes display to read "0." Always press "Zero" button after changing bedding and **before placing baby on scale.** If baby is already on scale, lift baby and then press "Zero" button while holding him.

   2. Pressing "Zero" button also causes scale to find its zero reference point to assure accurate measurements. When "Zero" button is pressed, moving dashes will appear on the display for a few moments. Wait until the dashes stop and a "0" appears before touching the scale.

3. **"Lock-Average" Button**—Locks the average weight computed by the microprocessor during the last 4 seconds, on the display. Press button again to unlock display. Leave button "locked" to retain last weight measurement if desired.

4. **"Gms/Lbs" Button**—Changes units between grams and pounds-ounces. Ounces are shown to nearest one-tenth. (Example: 2 4.2 equals 2 pounds, 4.2 ounces.) Indicator lights on display tell whether grams or pounds are being measured.

5. **Minimum Displayed Weight**—Scale will not display a weight of less than 15 grams.

6. **"Read Light"**—Comes on when "Lock Average" button is pressed, to indicate that weight is locked on display.

7. **"Overload" Light**—Will flash if weight on scale exceeds maximum capacity of 10,000 grams (22 pounds).

8. **Dashes**—Flash for few seconds during warm-up when scale is connected to power. Dashes also appear momentarily after "Zero" button is pressed.

9. **"Cable"**—Appears as reminder if cable between Display/Control Unit and weighing platform has not been connected.

Warm-Up

The scale is always on when it is connected to an electrical outlet. When first connected to an electrical outlet, a series of dashes will flash for a few seconds on the display to indicate the scale is warming up. When dashes have been replaced by numbers, the scale is ready for use.

To Cancel Weight of Bedding—

After the bed is made OR whenever the bed linen is changed, follow these steps:

- Press "Display On/Off" button to turn on display.
- If display is locked ("Read" light on), press "Lock" button to unlock.
- After changing bed linen, make sure that the bedding is touching **only** the mattress and scale platform (fig. 4-2).
- Make sure there are no extra objects on the scale (teddy bears, etc.).
- **Before placing baby on scale,** press "Zero" button. This cancels all weight on scale. The display will momentarily show a series of moving dashes. Do not touch the scale until a "0" appears on the display. (If baby is already on scale, lift him off platform and press "Zero" while holding him.)
- Place baby in center of scale mattress.
- Proceed with weighing. (See next section.)

NOTE: Negative Weight If negative weight numbers appear on the display (example: −150 gms) it indicates that some weight has been removed from the platform after the "Zero" button was pressed. Before placing baby on scale, press "Zero" and display will return to "0."

NOTE: Minimum Displayed Weight. Scale will not display a weight of less than 15 grams.

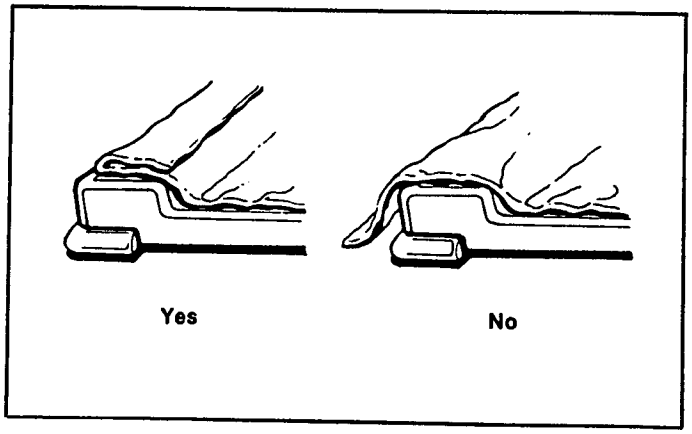


Fig. 4-2

To Weigh Baby

- Press "Display On/Off" button to turn on display.
- If display is locked ("Read" light on), press "Lock" button to unlock.
- Remove all loose objects from mattress and scale platform (teddy bears, scissors, etc.)
- Press "Gms/Lbs" button to select weight units.
- Lift IV tubes, monitors, leads, etc., and hold as steady as possible. (See next page for suggestions on lifting technique.)
- Take weight measurement—using either of following methods:
  1. **Mental Average**—Watch weight on display a few seconds, then select your best "mental average" weight. If you desire to verify the weight, take second "average." Then lay tubes and leads down and chart weight.
  2. **Use "Lock-Average" Button**—While you are holding the tubes and leads, have another nurse push the "Lock-Average" button. The best average weight, computed by the microprocessor during the last 4 seconds, will be locked on the display. Lay tubes and leads down and then chart weight.

Display On/Off

Display can be turned off between weighings, if desired, by pressing "Display On/Off" button. The scale remains on even when the display is off, so it does not require a further warm-up period.

Memory Feature

Smart Scale has a memory that retains all previous data when the display is turned off or even if electrical power is disconnnected. If the weight of the bed linen was previously cancelled out (by the "Zero" button), it will remain cancelled when the display is turned on again, and weighing can be resumed.

To Retain Last Weight Reading

The last weight reading can be locked on the display by pressing the "Lock-Average" button. This weight will be retained as long as the display is locked and even while the display is turned off.

Cleaning

Smart Scale can be wiped with a cloth dampened with any ordinary hospital disinfectant. Be careful not to spill any liquid on the scale that might enter the case and damage the electronics.

Lifting IV Tubes and Monitor Leads

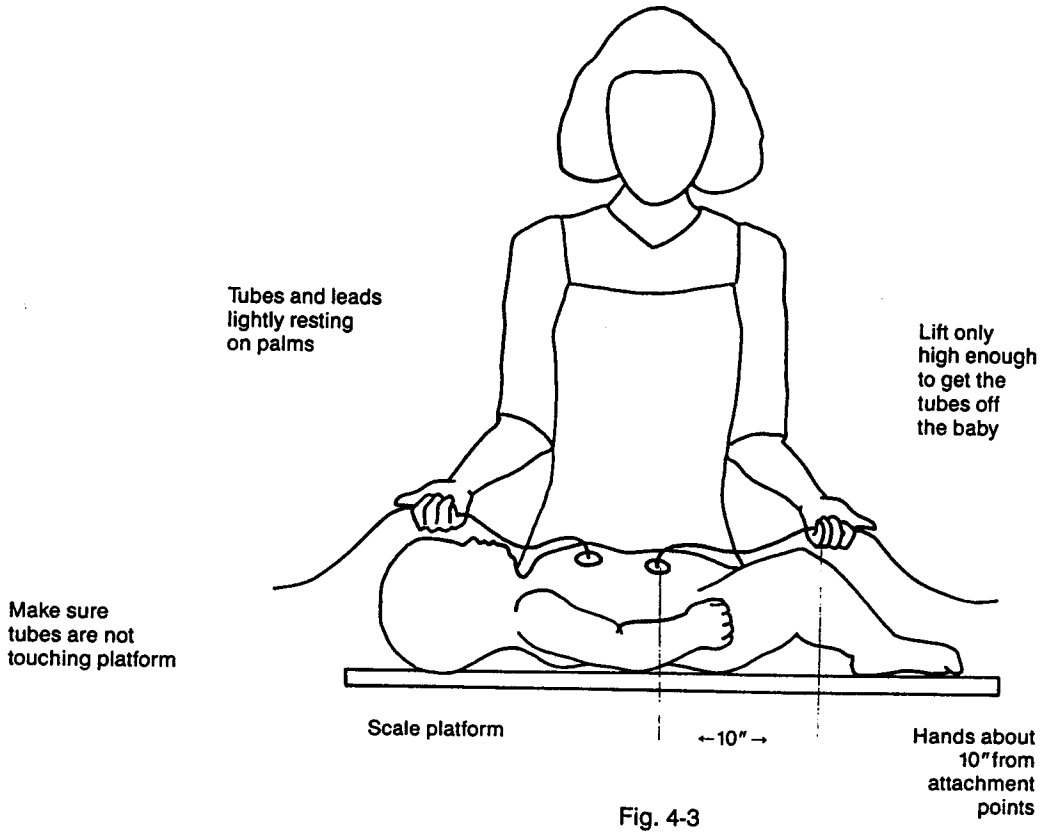

Tubes and leads lightly resting on palms
Lift only high enough to get the tubes off the baby
Make sure tubes are not touching platform
Scale platform
←10"→
Hands about 10" from attachment points

Fig. 4-3

For the most accurate, repeatable weight measurement when holding up IV tubes and monitor leads, follow this technique:

1. Before lifting the tubes and leads, note the total weight displayed on the scale. Usually, lifting the tubes and leads will reduce this weight from 25 to 50 grams.

2. Pick up the tubes and leads approximately 10" from where they are attached to the baby.

3. Do not hold the tubes and leads tightly. Let them rest in the open palms of your hands while lifting.

4. Gently raise your hands to the point where the tubes and leads are **just lifted off the baby's body—but no higher.** Lifting higher than is necessary can cause greater deviations in weight measurement.

5. Before taking weight reading, make sure that no tubes or leads are accidentally touching the scale platform.

VENTILATOR VIBRATION ON RADIANT WARMER BED WHILE ZEROING SCALE

When using ventilator on baby, prior to pushing zero, ventilator tubes should be lifted clear (Fig. 4-4) and not allowed to touch any part of radiant warmer. Once zero appears on readout, ventilator tubes may be returned to normal position.

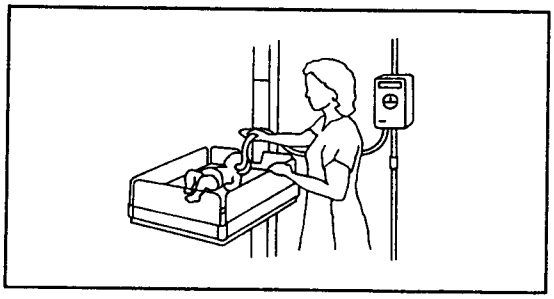


Fig. 4-4

Calibration

As with any precision electronic instrument, the Smart Scale can drift out of calibration over time. Since no electronic scale recalibrates itself automatically, the only way to assure correct recalibration is to place an accurate, known weight on the scale and make the required internal adjustments so that the scale displays the correct weight.

Calibration Weight

The Smart Scale calibration procedure requires a weight of 5000 ± 1 gm. If not available locally, this calibration weight may be ordered from Olympic Medical Corp. (Cat. No. 56332).

Calibration Upon Receipt

The Smart Scale was calibrated at our factory in Seattle prior to shipment. However, it should be recalibrated before being put into service because local variations in the force of gravity can affect calibration as much as 20 grams.

Calibration Frequency

Smart Scale calibration should be checked every six months for the first year. Then the frequency can be adjusted based on how far the Smart Scale has drifted. If it is staying within 1 or 2 grams, the calibration frequency can be reduced to every 12 months. For larger weight drift, increase the calibration frequency. If the drift is very large, check the Troubleshooting Section.

Calibration Procedure

Make sure the weighing platform is on a firm, level surface. The platform must be connected to the readout unit. Attach the extension platform (with mattresses in place). For best results, ambient air temperature should be between 70° - 75°F (21.2° - 23.9°C).

1. Remove the calibration cover on the readout unit (fig. 5-1) to expose the calibration controls. Unplug the power cord.

2. Set the DIP switches as follows (fig. 5-2):
   S1-1 Off (down)
   S1-2 On (Up)
   S1-3 Off (down)
   S1-4 Off (down)

3. Turn the fine calibration pontentiometers (R7, R21) to their mid-range.

4. Exercise the weighing platform load cell by placing the 5 kg calibration weight in the center for 10 seconds, then remove the weight for 10 seconds. Repeat 10 times.

5. Connect the power cord to electric power. Scale display will show "SCALE" then "CALIb" to indicate the calibration mode.

6. **CAUTION** **Do NOT press the ZERO button**

7. Place the 5.0 kg calibration weight in the center of the weighing platform. Allow the display to stabilize for 10 seconds.

8. Adjust R2 (COARSE ZERO) so that the display reads 32,768 ± 30.

9. Adjust R7 (FINE ZERO) so that the display reads 32,768 ± 4.

   NOTE: Due to electronic system "noise," the display will jitter ± 4 counts around this value. This is normal.

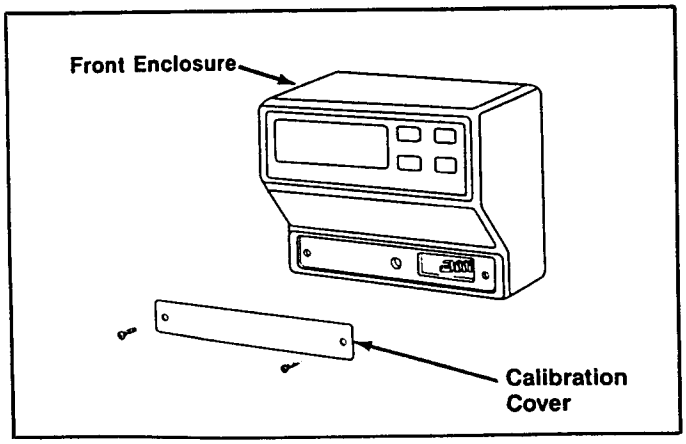


Fig. 5-1

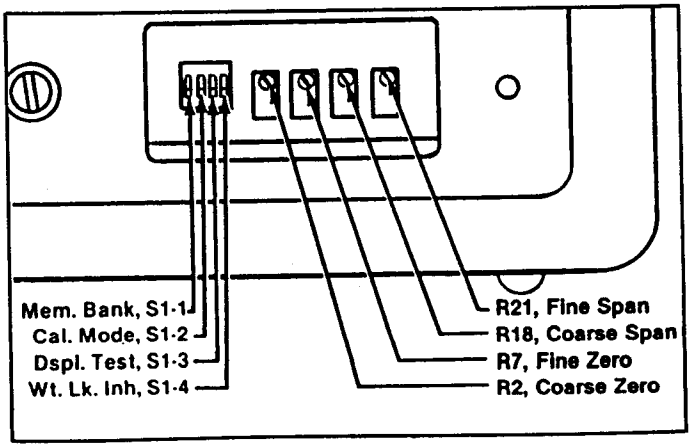


Fig. 5-2

10. Press the ZERO button. Display will read 0 ± 4.

11. Remove the calibration weight. Allow 10 seconds for display to stabilize.

12. Adjust R18 (COARSE SPAN) until the display reads -20,000 ± 30.

13. Adjust R21 (FINE SPAN) until the display reads -20,000 ± 4.

    NOTE: Due to electronic system "noise," the display will jitter ± 4 around this value. This is normal.

14. Press ZERO. Display should read 12,768 ±4. If not, repeat steps 7 thru 13 omitting the coarse adjustments of steps 8 and 12.

15. Put all DIP switches in the Off (down) position and replace the calibration cover.

Troubleshooting

The Olympic Smart Scale is designed to allow field servicing down to the printed circuit board (PCB) level. These instructions will assist you in isolating the problem PCB or component. The faulty board must be returned to Olympic Medical for repair or replacement.

In order to identify the problem, please read the "Troubleshooting" and the "Theory of Operation" sections carefully.

Static and Contamination: The integrated circuits and semiconductors on the PCBs can be damaged by electrostatic discharge or contamination by body oil. Observe proper handling precautions at all times.

Service requires disassembly of the Display/Control Unit be performed by qualified personnel only. **Do not remove printed circuit boards for troubleshooting.**

NOTE: The weighing platform is not a field repairable item and should not be disassembled. If the weighing platform is suspected of being defective it should be returned to Olympic Medical. When the platform is replaced or repaired the scale should be recalibrated.

Troubleshooting Hints

- Perform a visual inspection. All connectors and cables should be connected and secure. Check for chafed or pinched wires. Check for signs of components overheating. Check that all socketed parts are firmly seated in their sockets.
- Analyze symptoms BEFORE disassembly and troubleshooting. Read the theory of operation so you understand the system. Formulate a theory of a possible cause for the symptom and make tests to check your theory.
- Check the easiest and obvious first (such as fuses, mechanical interference, etc.).
- Make measurements with respect to signal ground, TP4 on the Digital board.

Static and Contamination Awareness

Most integrated circuits and semiconductors in this Scale can be damaged by electrostatic discharge. Exercise proper handling precautions to avoid damage.

- Minimize handling.
- Discharge your own static by touching grounded metal or by wearing a grounded wrist strap, before touching parts.
- Keep replacement boards in their anti-static bags until ready to use.
- Avoid touching pins or traces. Handle PCBs by edges to avoid static discharge and avoid contamination by oil from fingers.
- Avoid plastic, vinyl and styrofoam in the work area. Avoid wearing clothing which may pick up static electricity.
- Do not slide PCBs or components over any surface.

Disassembly for Troubleshooting

CAUTION Disconnect power cord from wall outlet.

1. Disconnect weighing platform connector at back of readout unit.
2. Remove the calibration cover at the front of the readout (fig. 5-3).
3. Remove the large screw in the center of the readout (under the calibration cover).
4. Pivot bottom of enclosure. Lift tab (in front half) out of slot (fig. 5-4).
5. Separate enclosure half to allow access to green ground wire. Disconnect wire (fig. 5-5).
6. Unplug P8 from J8 at the back of the display board (mounted in the front enclosure) and unscrew the green ground wire lug on the front of the chassis. The front half-shell can now be removed exposing the chassis. Digital board and Analog board are mounted in the rear enclosure.
7. The Display board and front panel assembly can now be removed from the front enclosure if desired.
8. To remove the chassis holding the other PCBs, lay down the unit on a soft surface.
9. Unscrew the four recessed screws in the rear.
10. Unscrew the 2 clamp studs, disassemble clamp, spring, washer.

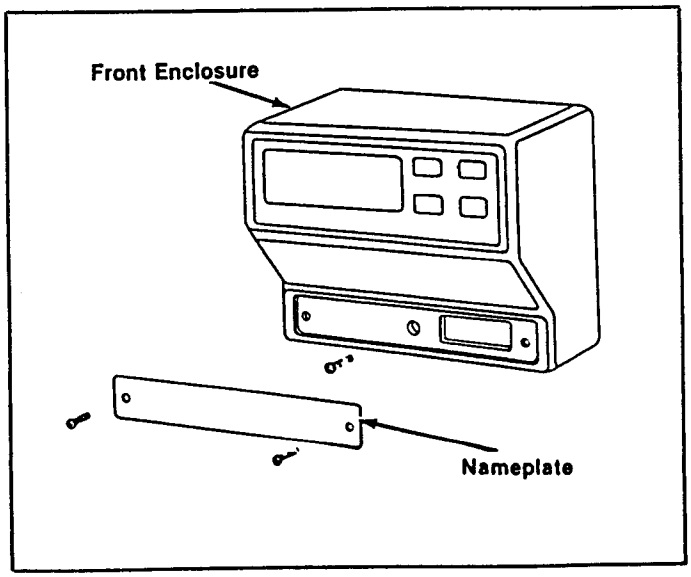


Fig. 5-3

11. Gently pull out the chassis assembly and slide the rear plastic case back a few inches on the power cord (fig. 5-4).

12. Reconnect display cable (P8) and green grounding wire to chassis. All test points are now exposed and unit is ready for troubleshooting.

13. Connect weighing platform cable to Display/Control Unit. Then connect power cord to wall outlet.

WARNING When unit is plugged in to 115 Vac, there is danger of electric shock anywhere up to the transformer. Use extreme care.

Proceed to next page for Troubleshooting.

Reassembly After Troubleshooting

1. Make sure electric power cord is disconnected from outlet.

2. Slide the chassis assembly into place.

3. Reattach the four reccessed screws in the rear.

4. Reassemble clamp, adjust spacing .80" away from enclosure.

5. Make sure the display cable and ground wire are connected.

6. Replace the front half of the enclosure.

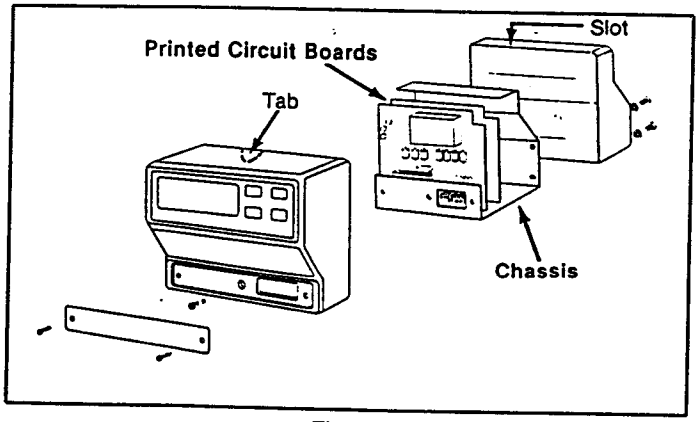


Fig. 5-4

7. Tighten the central screw.

8. Replace the calibration cover.

Removing Analog/Digital PCBs

CAUTION Make sure electric power is disconnected from wall outlet. Do not remove PCBs for troubleshooting.

First, disassemble per steps 1 through 10 in Disassembly instructions.

1. Disconnect P1 from the transformer (on the rear chassis) to J1 on the digital board.

2. Disconnect P5 from J5 on the analog board (fig. 5-5).

3. Remove the PCB assembly by removing the four screws and kep nuts on the digital board angle brackets.

4. Separate the two PCBs by unscrewing the screws in the four standoffs holding them together (fig. 5-6).

Reassemble the boards to the chassis by reversing the above steps.

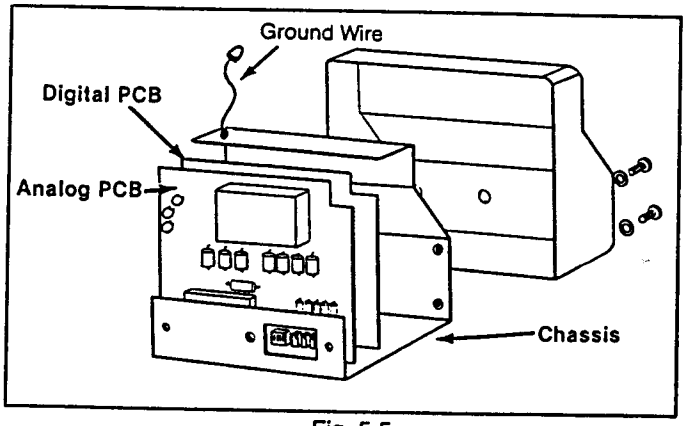


Fig. 5-5

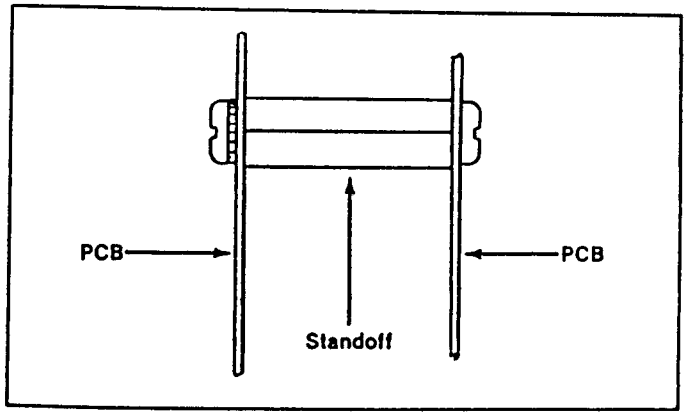


Fig. 5-6

Symptoms and Suggested Tests

Scale will not zero with the "Zero" button:

CHECK IF DISPLAY SHOWS "WALKING" DASHES AFTER "ZERO" BUTTON IS PRESSED. If it does but the unit will not arrive at a steady zero, there are two possible causes:

1. THE SIGNAL IS BEYOND THE ZERO CAPTURE RANGE.

2. THE SIGNAL IS TOO UNSTABLE TO ACQUIRE ZERO.

   Both could be caused by a power problem. Check +5V DIG, +5V ANA and −5V ANA at test points. (Gnd is TP4, +5V DIG is TP3 on Digital Board, +5V ANA is TP4, −5 ANA is TP5 on Analog Board.) If voltages are OK, check signals on Analog board. Make sure load cell connector is plugged into J5. The analog signal at TP2 must be between +1.010 V and −1.010 V to be within the A/D range. Typical signal at TP2 with no load (if zero pot is adjusted properly) is −0.670 V. The typical reference voltage on the A/D at TP3 is 0.549 V.

IF NO "WALKING" DASHES APPEAR WHEN "ZERO" BUTTON IS PRESSED:

1. Make sure scale is "unlocked" (Green READ LED off).

2. Check cables and connectors from front panel to digital board. Pressing the "Zero" button should cause a low on RN1, Pin 3 and/or on U6, Pin 1.

Scale won't come on when plugged in to power:

1. Check fuse. Make sure connector P1 from the transformer is connected to J1 on the Digital board.

2. Check that CR9 LED on Digital board turns on. If so, and if +5V DIG is present at TP3, check that this +5V and ground is getting to the microprocessor.

3. If CR9 won't illuminate, check that +8V is present at TP2 on the Digital board.

4. If +8V not at TP2, check the ac input through F1 and filter FL1 to primary of T1. T1 secondary voltage coming into J1 (pins 1 and 3) should be about 13.5 Vac (no load). If not, the transformer, T1, is defective.

5. Voltage across the large electrolytic capacitor C2 should be about 15 Vdc. If not, check bridge rectifier diodes, CR1 - CR4 and transient suppressor CR5. If OK, replace the digital board.

6. If voltage is present across C2 but yet no +8V at TP2, regulator VR1 is bad; replace Digital board.

Scale will not "lock" the display and the READ light will not come on:

1. Check that the DIP switch S1-4 on Analog board is off (down).

2. Pressing LOCK/AVG should provide a low to pin 16 of U6 on Digital board. If not, check membrane switch on front panel and connectors down to the Digital board.

3. If pin 16 of U6 is getting the signal but the lock function is still inoperative, replace Digital board.

Scale will not change units:

1. Pressing the GM/LB switch should provide a low to pin 23 of U6 on Digital board.

2. If not, check membrane switch on front panel and connectors down to the Digital board. If pin 23 of U6 is getting the signal, replace Digital board.

Some segments or annunciator lights do not come on:

1. Turn on the scale by plugging it in while holding any one of the front panel switches. This will allow viewing of all segments and lights.

2. If all LEDs do not light, replace the display board.

Scale will not weigh accurately:

1. Verify calibration.

2. Check that nothing (cables, etc.) is touching or rubbing on the platform. All load must go through the load cells.

3. If there is hysteresis exceeding ±2 grams (it weighs differently going up in weight than going down in weight), send platform to Olympic Medical for service.

4. Slight linearity errors (exceeding specifications) or off-center load errors are probably due to a defective load cell. Replace weighing platform.

5. If errors are random or there is a linearity problem, check power supply voltages.

6. If power supply voltages are OK and getting to the Analog board, weighing inaccuracy or drift can be caused by the load cell or the Analog board.

7. Using a digital voltmeter of adequate resolution (4½ digits or better) and sensitivity, with ungrounded (floating) differential input, monitor the load cell output directly between pins 5 of U1 and U2 on the Analog board.

8. The +5V analog used for load cell excitation should also be monitored and load cell signals normalized to that. This could determine if load cell or the Analog board is the cause. If not sure send both the platform and the Analog board back to Olympic Medical for analysis.

Theory of Operation

Refer to fig. 5-8 for a block diagram.

Load Cells

Two load cells in the weighing platform each form a Wheatstone Bridge and are connected in parallel (fig. 5-7). An excitation voltage is applied at two opposite corners and a signal voltage comes off the remaining two corners. As weight is applied, two "resistors" are in compression and two are in tension, changing the resistance and causing a differential analog signal voltage which is proportional to the applied weight.

Analog Board

Signal Flow: The load cell analog signal is amplified by an instrumentation amplifier. Then it is filtered and sent to the Analog-to-Digital converter which provides binary data to the microcomputer (on the digital board).

The analog board also holds the DIP switches used in the calibration procedure.

Circuit Description: U1 and U2 form a differential, chopper-stabilized instrumentation amplifier. The gain of U1 and U2 is fixed by R10, R11, and R14 at 187.2. These are special, precision-matched resistors. Amplifier input is guarded at the common mode voltage of approximately +2.5 volts, provided by U3. U4, a high-accuracy unity-gain amplifier, changes the differential input to a single-ended output. Zero offset is provided by R2, R7, and U9. The signal from U4 output is fed through either filter 1 or 2 to the input of the A/D converter. Analog switches in U7 are used to select the appropriate filter.

Filter 1: A "light" filter that allows rapid acquisition of the weight data. This filter is used during weighing. The microcomputer provides averaging to get the best possible approximation of weight. The average of the last 3.5 seconds of readings is displayed when scale is locked.

Filter 2: Smooths out signal while scale is zeroing. The filter is automatically selected by the microcomputer.

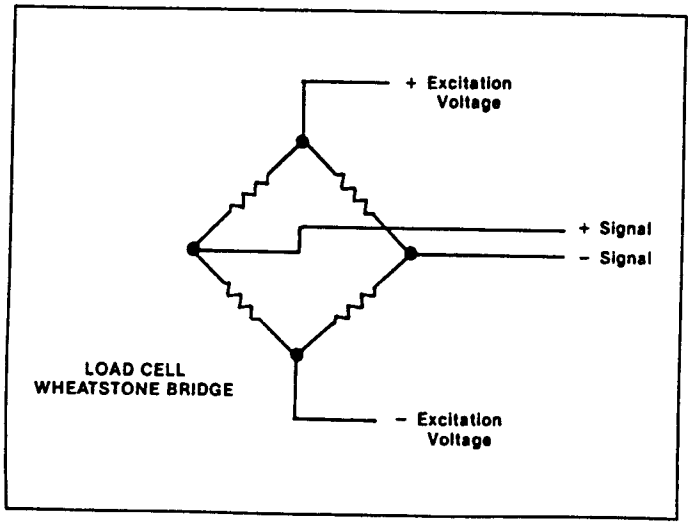


Fig. 5-7

Analog to Digital (A/D) Converter

U8 is an integrating dual slope-type converter with a conversion cycle of approximately 400 milliseconds. The dynamic range is ±32,768 counts (15 bits plus sign, or a total of 65,536 counts). The input signal to the A/D converter is 134 microvolts per gram.

The converter internally resolves to ¼ gram. It divides 10 kilograms (maximum weight for scale) into 40,000 counts (±20,000 range). A/D gain is controlled by R18 and R21, which provide a reference voltage that is ½ of the A/D range, or 0.54 volts (typically) at TP3.

The A/D gain is fully ratiometric. If the ±5 volt excitation signal to the load cell decreases slightly, the load cell output signal decreases proportionately. The A/D reference voltage will also decrease, thus increasing the A/D sensitivity (gain) and the resultant digital output will remain the same.

Zero offset is such that 5.0 kg provides a zero input voltage to the A/D converter. 10 kg will equal +0.67 volts and 0 kg equals −0.67 volts (measured at TP2).

Zero offset voltage at TP1 will be lower than −0.67 volts because it must also cancel out any load cell zero offset and the weight of the mattress, supporting structure, and the extension platform with its mattress. Voltage at TP1 will typcially be around −1.23 volts if there is no load cell offset and the extension platform is in place.

The microcomputer (next section) monitors the DATA VALID line. When it is "valid," the microcomputer reads the A/D binary output. Depending on the request by the microcomputer, via the high byte or low byte enable lines, the A/D converter presents the high order or low order bits on the eight data lines.

NOTE: All voltages are nominal. Each scale varies depending on its specific load cell sensitivity and zero offset.

Digital Board

Signal Flow: The A/D signal is processed by the microcomputer which has an input-output (I/O) expander. The microcomputer has internal RAM (random access memory). An external EPROM, U5, (erasable-programmable read only memory) is used.

Circuit Description: The microcomptuer, U3, is an 80C39. It has 128 bytes of internal RAM. Microcomputer operation is controlled by software in the EPROM. An external, non-volatile RAM, U7, is used to store zero reference and mode data while scale is disconnected. The computer performs the following duties:

1. **Housekeeping Chores.** Such as initialization. Checking for overrange, and checking if the platform cable is connected.

2. **Zero Tracking.** If zero shifts of less than ±3.25g occur.

3. **Computes Correct Weight.** Determines weight in grams and pounds/ounces when weight is applied. Suppresses readings below ± 15 grams.

4. **Selects Analog Filter.** Light filter for weighing; heavy filter for zeroing.

5. **Averaging Routine.** Locks the average of the last 8 readings on the display.

6. **Continuously scans the front panel switches.** Changes units, zeros, locks or unlocks and turns the display on or off as requested.

7. **Display signal decoding** or other formatting to illuminate the correct digital segments and annunciator lights.

8. **Updates the non-volatile memory** whenever the units, mode or zero reference is changed.

The Input-Output (I/O) Expander: Receives data signals from the microcomputer and the switches on the front panel. It also controls the display drivers for the front panel and transmits serial data to each one. It also communicates with the non-volatile RAM.

Display Board

Data is simultaneously clocked into two display drivers via a common clock. The format is one start bit followed by 35 data bits. On the 36th clock cycle, all 35 data bits are latched to the outputs of the display drivers.

Each display driver has a brightness control (R3 and R8). By placing an ammeter between appropriate terminals of E1, it is possible to measure current of a group of lit segments.

Power Supply

Power supply for the Smart Scale Model 35 is divided between the two major printed circuit boards and the chassis.

Chassis Mounted Components: AC power from the power cord comes into the chassis of the Display/Control unit. The chassis has F1 (a normal blow fuse), a filter, and a transformer. The secondary of the transformer is connected to the digital board through P1-J1.

Digital Board Components: CR1 through CR4 form a full wave bridge rectifier. CR5 is a transient voltage suppressor, and C2 and C3 provide filtering. VR1 is a +8 volt voltage regulator. All scale current goes through VR1. All these circuits are live when the scale is plugged in, whether the display is on or off.

Circuit Description: Voltage regulator VR2 provides a digital +5 volts. CR9, a small LED, situated on the digital board is on when the scale is plugged in.

Analog Boad Components: Power comes off the digital board and goes to U5, a negative switching regulator, and VR3, a +5 volt voltage regulator. U5 provides a negative voltage. VR3 provides a regulated +5 volts for the analog circuitry. The negative voltage from U5 is applied to U6, which has a gain of −1. U6 inverts the +5 volt analog from VR3 to a tracking −5 volt analog voltage. The A/D is on the analog board. See section A/D.

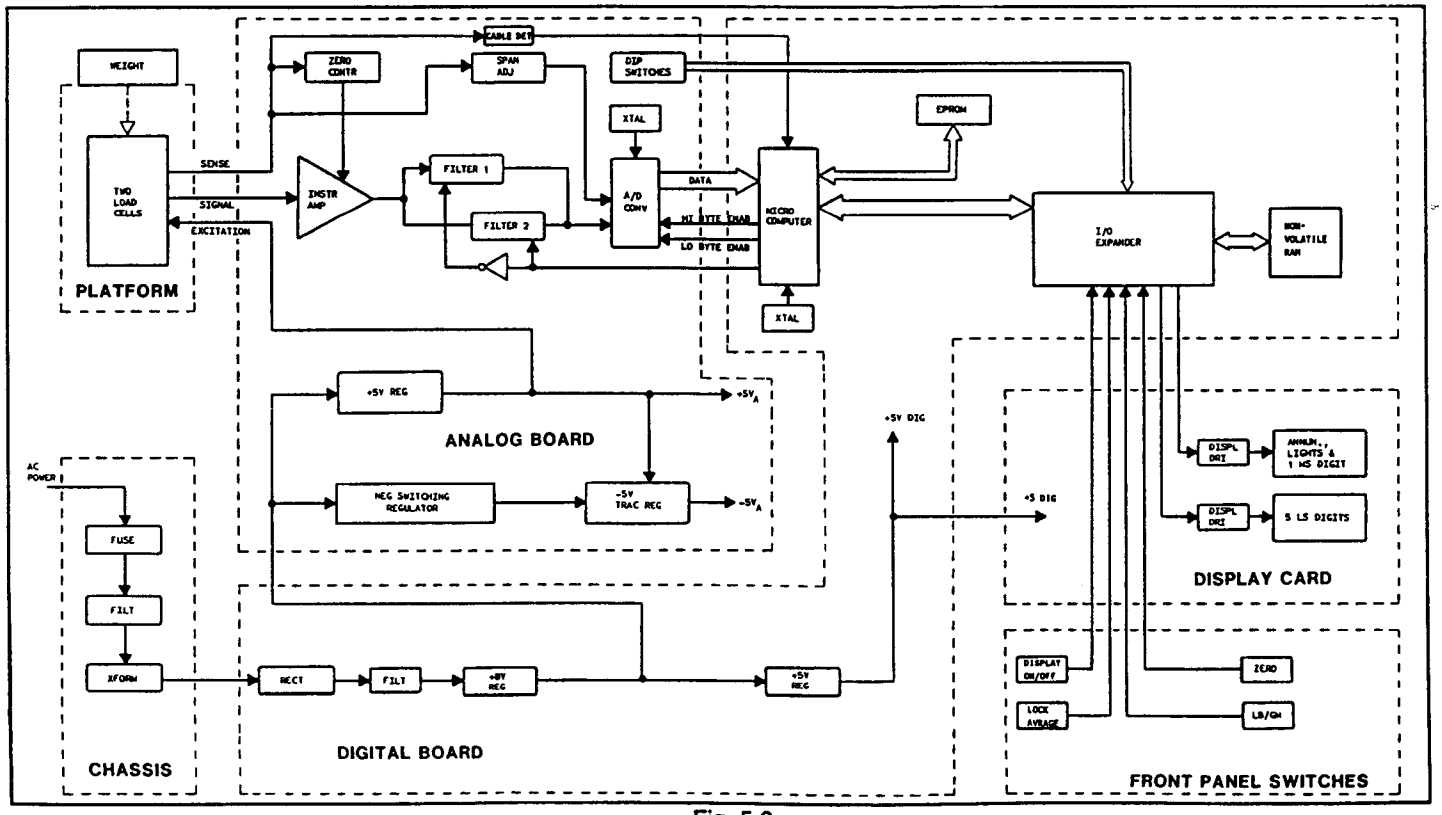
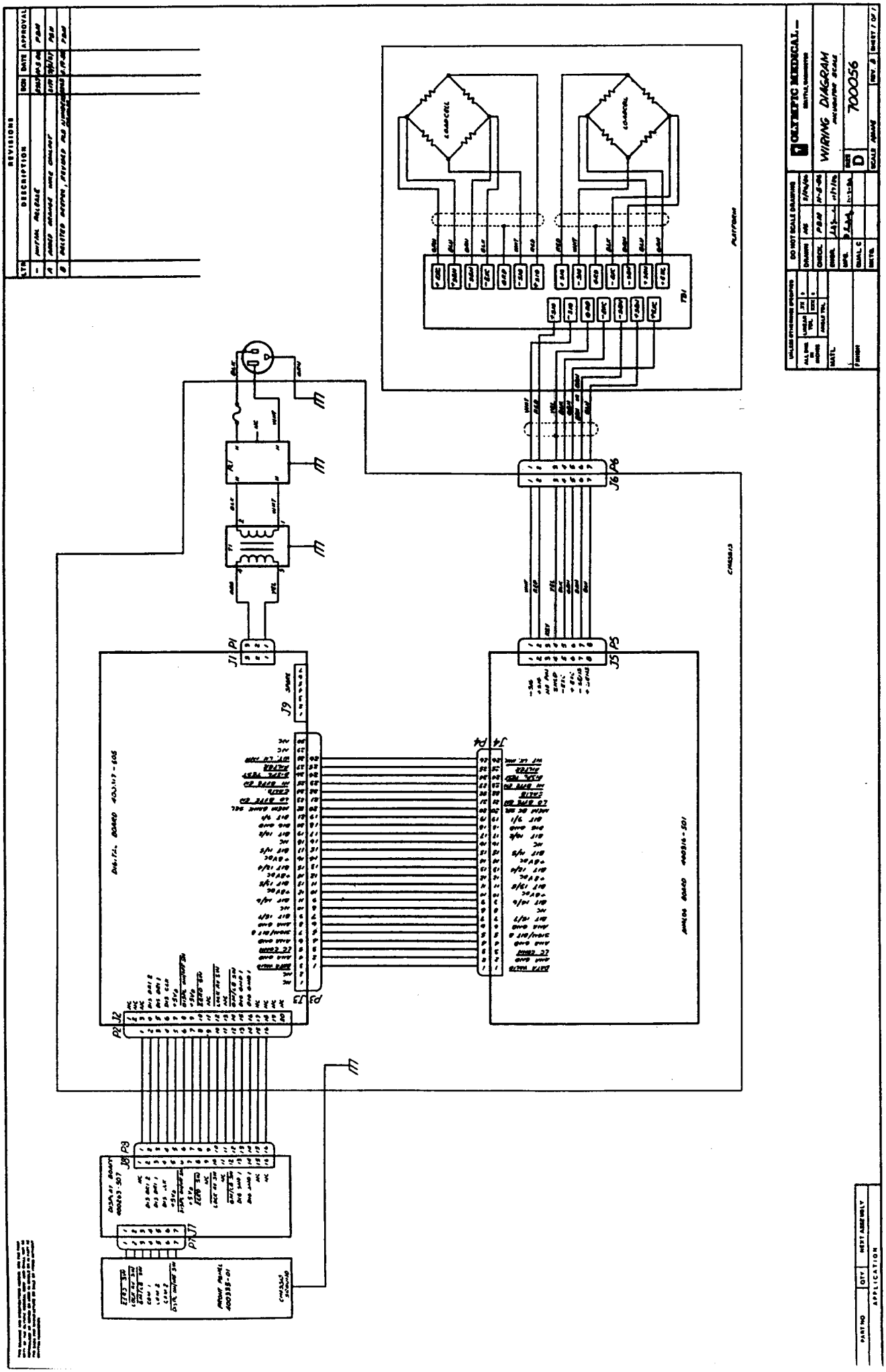
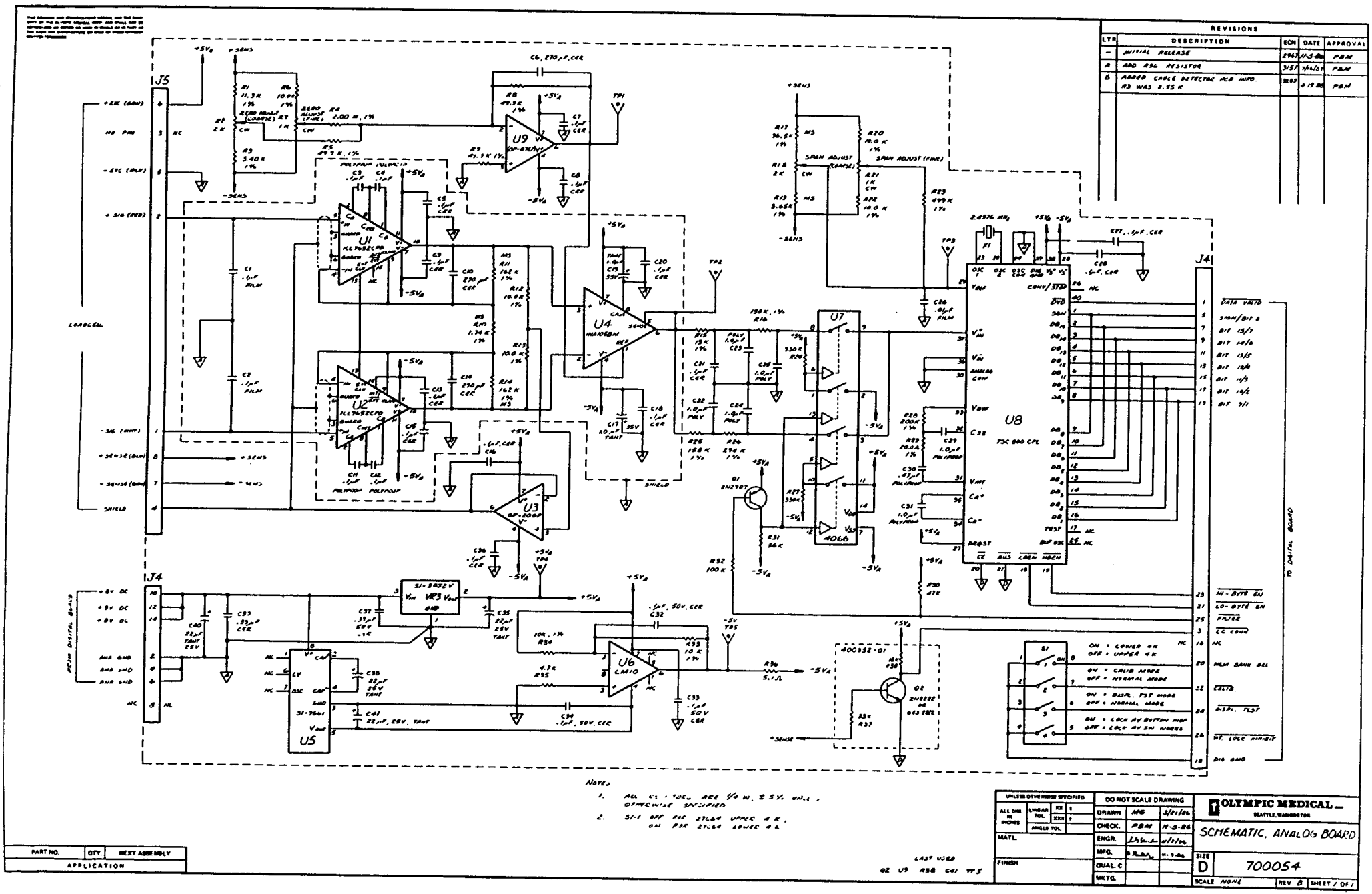
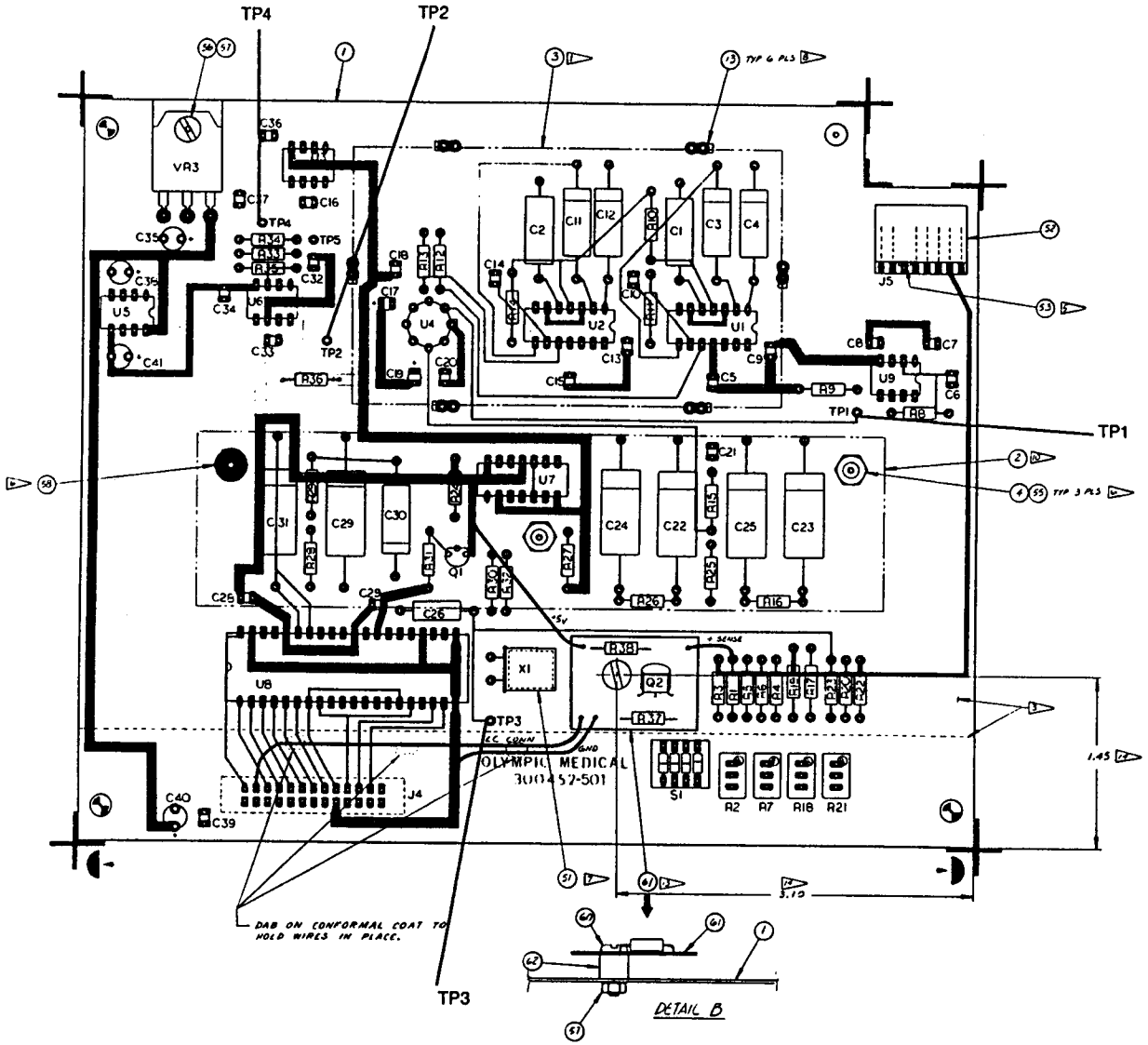


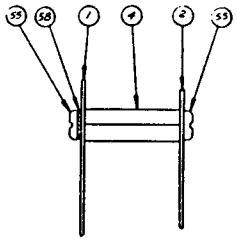
Fig. 5-8


REVISIONS
DESCRIPTION
INITIAL RELEASE
ADDED GRAPHIC USER CONTROL
ADDED GRAPHIC USER CONTROL
OLYMPIC MEDICAL
WIRING DIAGRAM
700056
DO NOT SCALE DRAWING
PLATFORM
CHASSIS
ANALOG BOARD
DIGITAL BOARD
FRONT PANEL
CHASSIS GROUND
J1 P1
J2 P2
J3 P3
J4 P4
J5 P5
J6 P6
J7 P7
J8 P8
J9 P9


REVISIONS
LTR | DESCRIPTION | ECN | DATE | APPROVAL
- | INITIAL RELEASE | 2961 | 11/5/86 | PBM
A | ADD 33Ω RESISTOR | 3151 | 1/14/87 | PBM
B | ADDED CABLE DETECTING MCU INPUT. R3 WAS 8.95 K | 3283 | 4/19/88 | PBM
J5
J4
J1
U1
U2
U3
U4
U5
U6
U7
U8
U9
4066
LOADCELL
SHIELD
TO DIGITAL BOARD
FROM DIGITAL BOARD
Notes:
1. ALL RESISTORS ARE 1/4 W, ± 5% UNLESS OTHERWISE SPECIFIED
2. S1-1 OFF FOR 27C64 UPPER 4 K, ON FOR 27C64 LOWER 4 K
PART NO. | QTY. | NEXT ASSEMBLY
APPLICATION
UNLESS OTHERWISE SPECIFIED
ALL DIM IN INCHES
LINEAR TOL. XX ± .1, XXX ± .0
ANGLE TOL.
MATL.
FINISH
DO NOT SCALE DRAWING
DRAWN MG 3/21/86
CHECK. PBM 11-3-86
ENGR.
MFG.
QUAL. C
MKTG.
OLYMPIC MEDICAL — SEATTLE, WASHINGTON
SCHEMATIC, ANALOG BOARD
SIZE D 700054
SCALE NONE REV B SHEET 1 OF 1

REVISIONS				
LTR	DESCRIPTION	ECN	DATE	APPROVAL

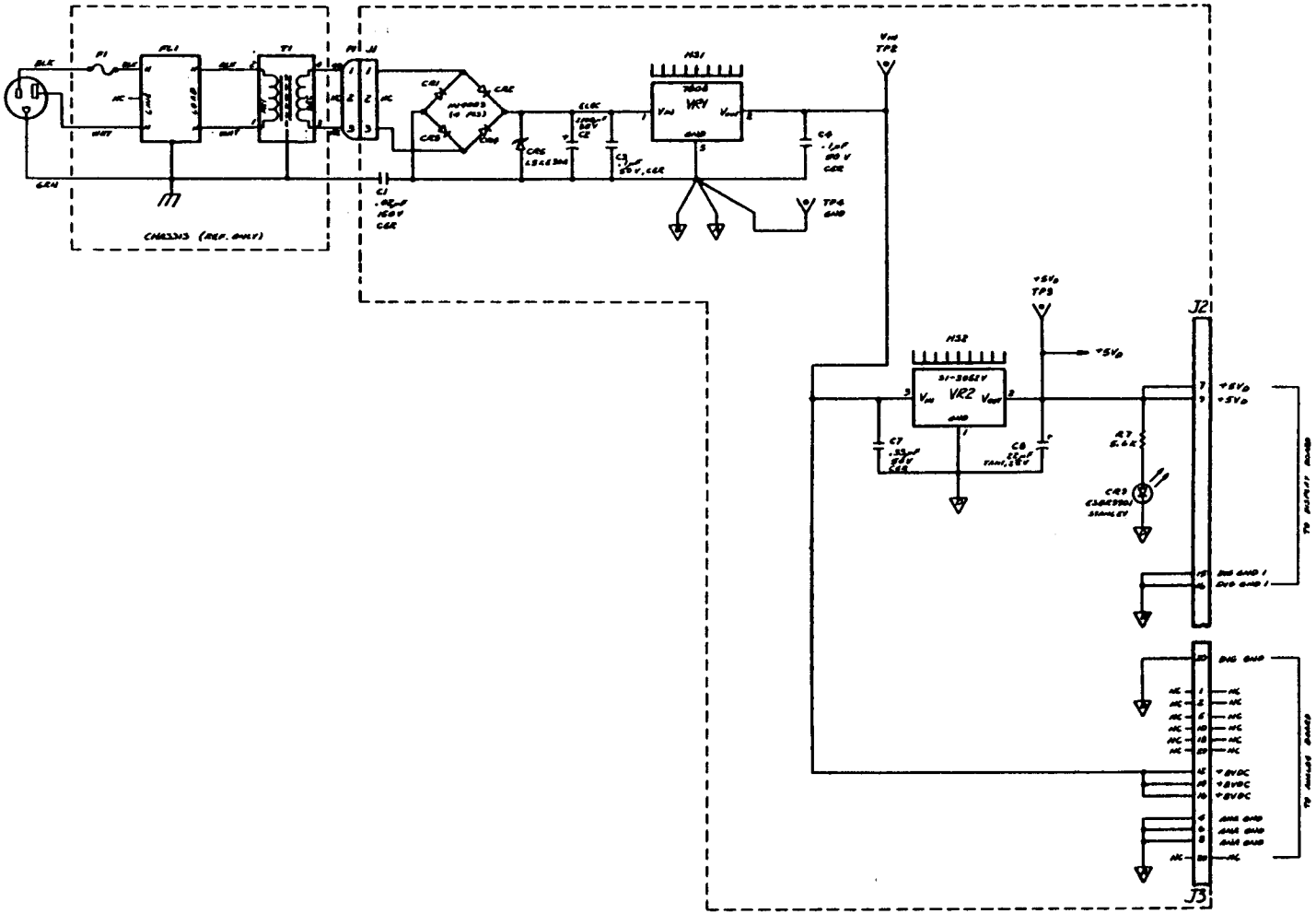




PART NO.	QTY	NEXT ASSEMBLY
APPLICATION		

DO NOT SCALE DRAWING			OLYMPIC MEDICAL SEATTLE WASHINGTON
DRAWN	M.G.	6/4/86	PCB ASSY, ANALOG
CHECK	P.B.M.	11-5-86	
ENGR			
MFG			SIZE D 400316
QUAL C			
MKTG			SCALE NONE REV B SHEET 1 OF 1
MATL			
FINISH			

REVISIONS				
LTR	DESCRIPTION	BCN	DATE	APPROVAL
–	INITIAL RELEASE			PBM
A	ADDED C810, C811			PBM
B	REVISED AS REQUIRED CHANGE FOR P1 (PURSE) AND PLUG (WHT, GR)			PBM
C	DELETED Q1, R2, R1, C806, C810, C811, C6, R5, C4, C817, R8, R6, R9, W, W2, Q2, C813, W1. ADDED Q3, R10, R4, R11; ADDED U7			PBM



NOTES:

1. ALL RESISTORS ARE 5%, 1/4 W UNLESS OTHERWISE SPECIFIED
2. R4 IS A BECKMAN 699-3-R2K OR EQUIV.
4. SYSTEM CONFIGURATION:

CONFIG	ICE	600247		
		-005		
U8	ICE	200CD		
U6	NONE	NONE		
U5	NONE	8PC64		
JP1	1-2	1-2	1-2	
JP2	2-3	2-3	2-3	

PART NO.	QTY.	NEXT ASSEMBLY
APPLICATION		

UNLESS OTHERWISE SPECIFIED: ALL DIM. IN INCHES; LINEAR TOL. .XX ±, .XXX ±; ANGLE TOL. ±; MATL; FINISH

DO NOT SCALE DRAWING

DRAWN	MS	3/29/84
CHECK.	PBM	4-6-84
ENGR.		
MFG.		
QUAL. C		
MKTG.		

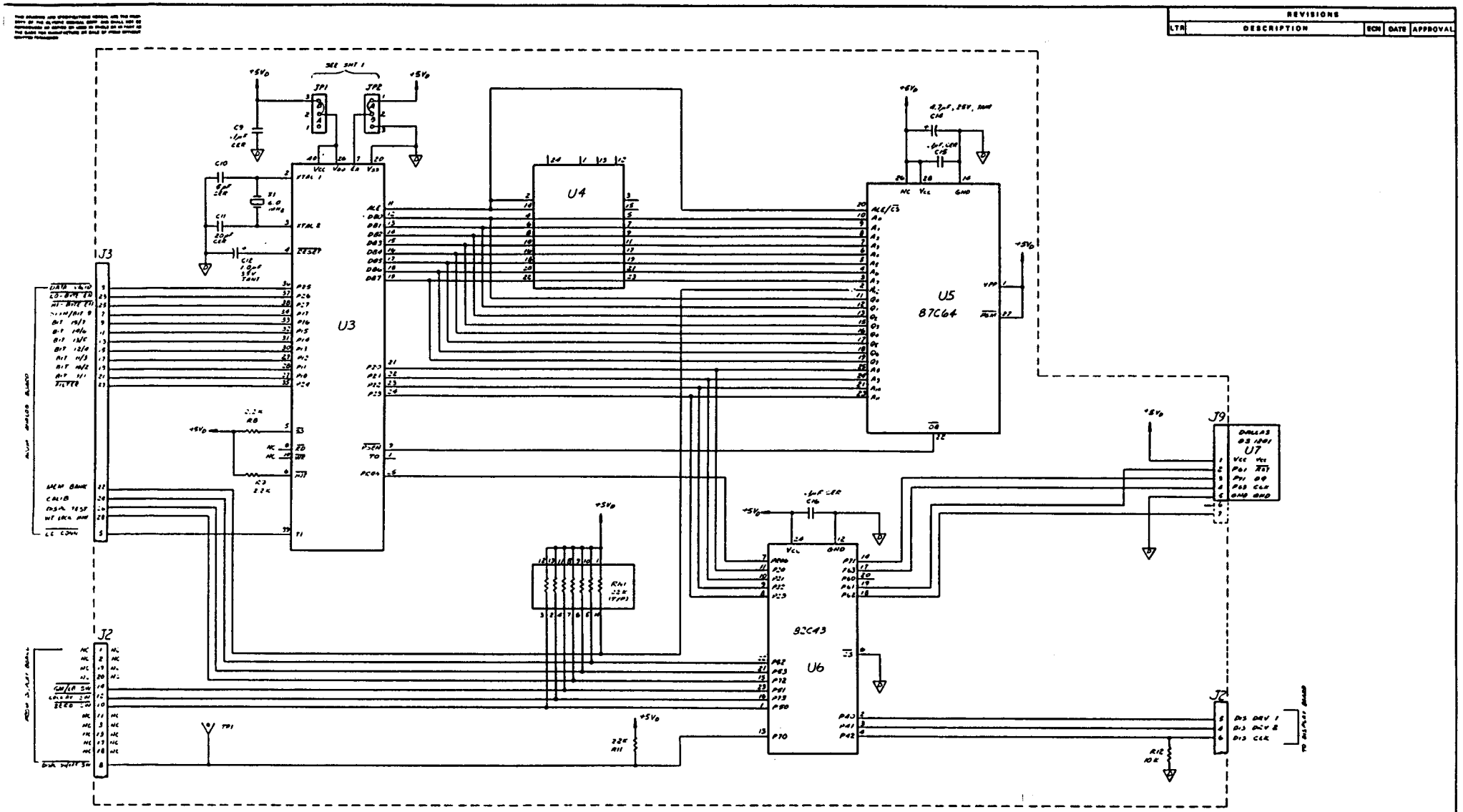
OLYMPIC MEDICAL — SEATTLE, WASHINGTON

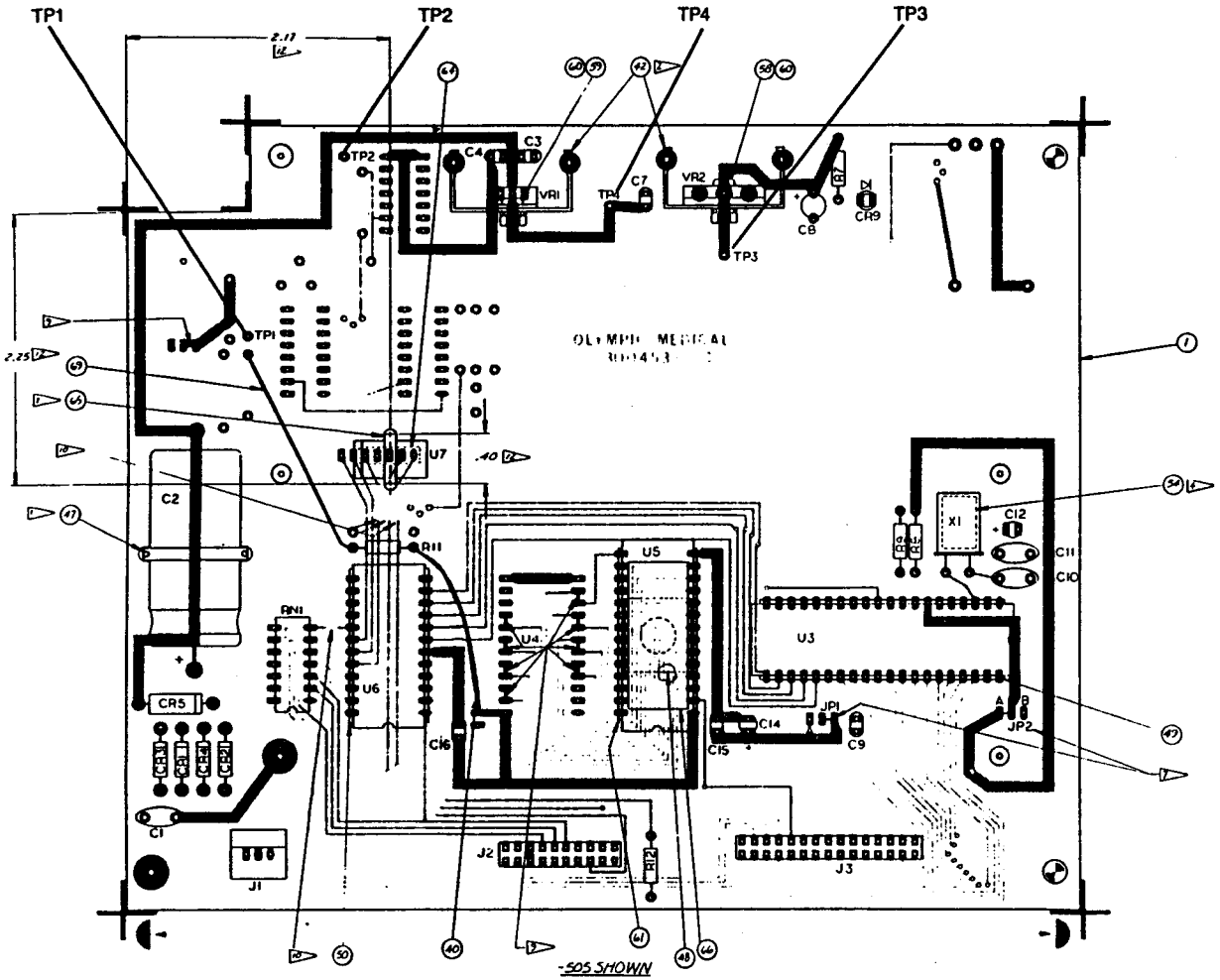
SCHEMATIC, DIGITAL BOARD

INCUBATOR SCALE

SIZE D | 700055

SCALE NONE | REV. C | SHEET 1 OF 2


REVISIONS
LTR
DESCRIPTION
ECN
DATE
APPROVAL
U3
U4
U5
87C64
U6
93C43
U7
J2
J3
J9
J7
RN1
TP1
TP2
+5V
SEE SHT 1
DO NOT SCALE DRAWING
OLYMPIC MEDICAL
SEATTLE, WASHINGTON
SCHEMATIC, DIGITAL BOARD
MICROPROC SCALE
700055
SIZE D
SCALE NONE
REV. C
SHEET 7 OF 7
PART NO.
QTY.
NEXT ASSEMBLY
APPLICATION



REVISIONS				
LTR	DESCRIPTION	ECN	DATE	APPROVAL

DO NOT SCALE DRAWING	OLYMPIC MEDICAL	
DRAWN MJG 6/3/86	PCB ASSY, DIGITAL	
CHECK PBM 11-6-86	SIZE D	400317
ENGR	SCALE NONE	REV C SHEET 2 OF 2
MFG		
QUAL		
MATL		
FINISH		

PART NO	QTY	NEXT ASSEMBLY
APPLICATION		

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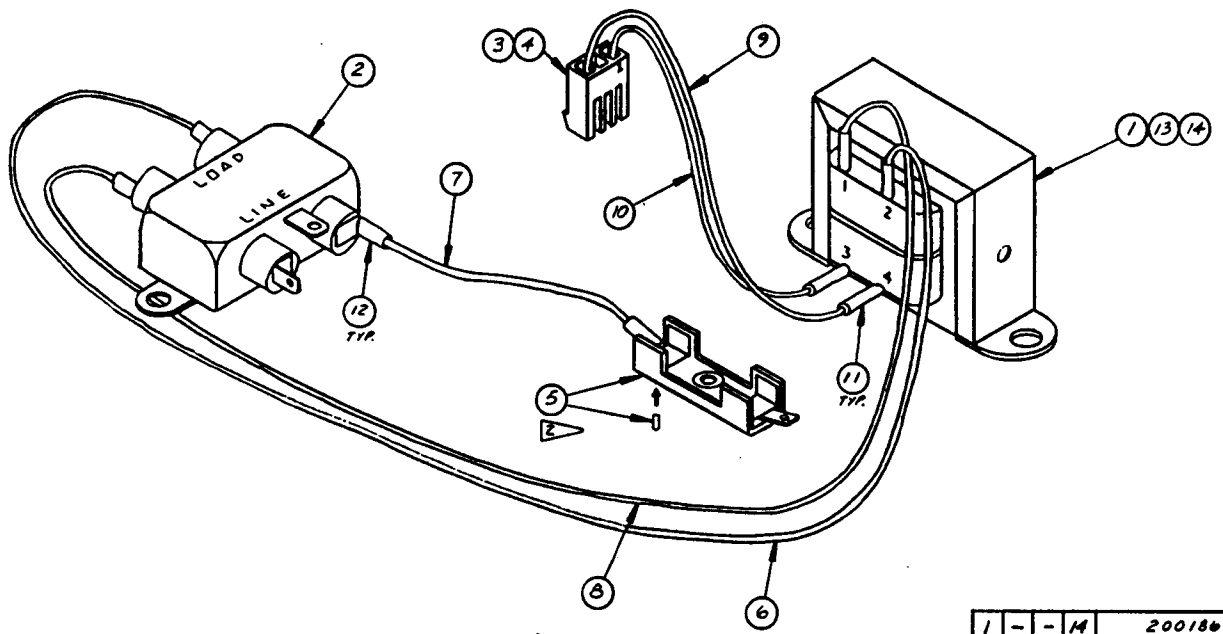
IS-N2

REVISIONS				
LTR	DESCRIPTION	ECN	DATE	APPROVAL
-	INITIAL RELEASE	2967	11-5-86	PBM
A	ADD -501 ASSY (240 V)	3200	11/13/87	PBM
B	ADD -503 ASSY (220V)			



NOTES:

1. ALL WIRE CONNECTIONS TO BE MECHANICALLY SECURE PRIOR TO SOLDERING.
2. ASSEMBLE ITEM 5, FUSEHOLDER SO THAT ANTI-ROTATION TAB 13 AS SHOWN.

-503	-501	-01	ITEM NO	PART NO.	DESCRIPTION
1	-	-	14	200186 - 501	TRANSFORMER
-	1	-	13	200186 - 01	TRANSFORMER
4	4	4	12	900016 - 01	TUBING, HEAT SHRINK (3/4" LG)
4	4	4	11	900016 - 505	TUBING, HEAT SHRINK (3/4" LG)
1	1	1	10	900002 - 559	WIRE, YELLOW (3½" LG)
1	1	1	9	900002 - 557	WIRE, ORANGE (3½" LG)
1	1	1	8	900002 - 541	WIRE, WHITE (13" LG)
1	1	1	7	900002 - 539	WIRE, BLACK (8" LG)
1	1	1	6	900002 - 539	WIRE, BLACK (14" LG)
1	1	1	5	200128 - 501	FUSE HOLDER ▷2
2	2	2	4	200123 - 01	TERMINAL, MOLEX CRIMP
1	1	1	3	200122 - 01	CONNECTOR, MOLEX
1	1	1	2	200129 - 01	FILTER
-	-	1	1	200060 - 515	TRANSFORMER
X				400315 - 503	TRANSFORMER/FILTER ASSY. (220V 50/60 Hz)
	X			400315 - 601	TRANSFORMER/FILTER ASSY (240V 50/60 Hz)
		X		400315 - 01	TRANSFORMER/FILTER ASSY. (110 V, 60 Hz)

PART NO.	QTY.	NEXT ASSEMBLY
400315 - 503		400312
400315 - 501		400312
400315 - 01		400312
APPLICATION		

UNLESS OTHERWISE SPECIFIED
ALL DIM. IN INCHES — LINEAR TOL. .XX ± .09; .XXX ±; ANGLE TOL.
MATL SPECIFIED ABOVE
FINISH
QTY. PER ASSY.

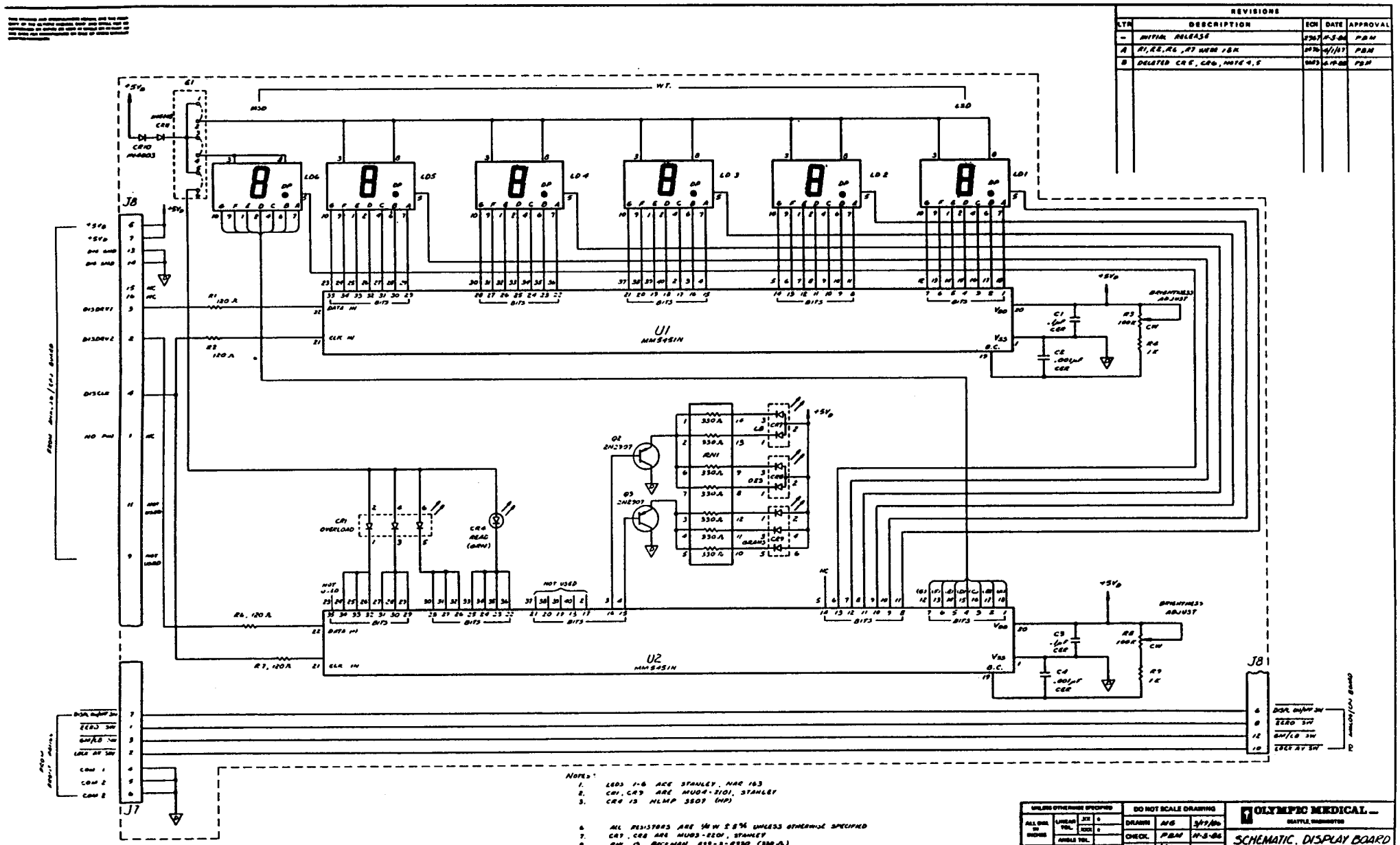
DO NOT SCALE DRAWING

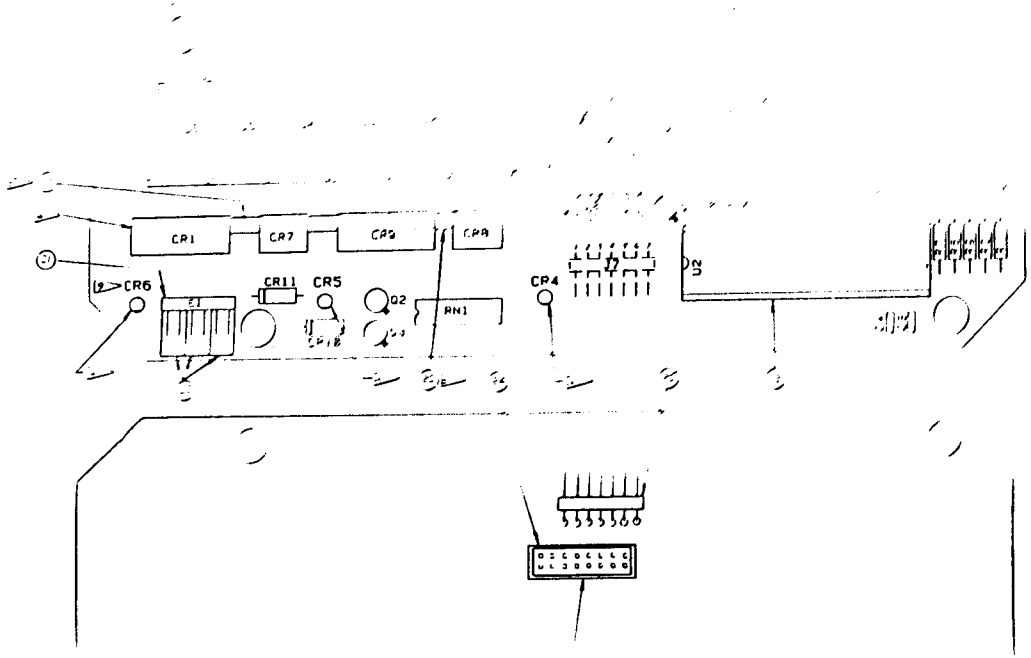
DRAWN	MJG	8/12/86
CHECK.	PBM	11-5-86
ENGR.		
MFG.		
QUAL C		
MKTG.		

OLYMPIC MEDICAL
SEATTLE, WASHINGTON

TRANSFORMER/FILTER ASSY

SIZE C | 400315 | SCALE NONE | REV. B | SHEET 1 OF 1


REVISIONS
LTR DESCRIPTION ECN DATE APPROVAL
- INITIAL RELEASE 5967 11-5-86 PBM
A R1, R2, R6, R7 WERE 180 Ω. 6478 4/1/87 PBM
B DELETED CR5, CR6, NOTE 4, 5 6683 6-19-88 PBM
J8
J1
U1
MM5451N
U2
MM5451N
WT.
LSD
MSD
LD1
LD2
LD3
LD4
LD5
LD6
R1 120 Ω
R2 120 Ω
R6 120 Ω
R7 120 Ω
Q2 2N2907
Q3 2N2907
CR1 OVERLOAD
CR4 REAC (GRN)
RN1
330 Ω
BRIGHTNESS ADJUST
R3 100K
R4 1K
R8 100K
R9 1K
C1 .1μF CER
C2 .001μF CER
C3 .1μF CER
C4 .001μF CER
Notes:
1. LED3 1-6 ARE STANLEY, MAN 163
2. CR1, CR3 ARE MUD4-5101, STANLEY
3. CR4 IS HLMP 3507 (HP)
6. ALL RESISTORS ARE 1/4 W ± 5% UNLESS OTHERWISE SPECIFIED
7. CR1, CR3 ARE MUD3-5201, STANLEY
8. RN1 IS BECKMAN 899-3-R330 (330 Ω)
PART NO. QTY NEXT ASSEMBLY
APPLICATION
DO NOT SCALE DRAWING
OLYMPIC MEDICAL
SEATTLE, WASHINGTON
SCHEMATIC, DISPLAY BOARD
INCUBATOR SCALE
SIZE D 700053
SCALE NONE REV. B SHEET 1 OF 1


CR1
CR7
CR9
CR8
CR6
CR11
CR5
Q2
RN1
CR4